Desalination and Water Treatment
www.deswater.com

doi: 10.1080/19443994.2013.800825

52 (2014) 3466–3476
May

Taylor & Francis
Taylor & Francis Group

Alkali-treated fly ash for the removal of fluoride from aqueous solutions

C.K. Geethamani, S.T. Ramesh*, R. Gandhimathi, P.V. Nidheesh

Department of Civil Engineering, National Institute of Technology, Tiruchirappalli, Tamil Nadu, India
Tel. +91 431 250 3166; Fax: +91 431 250 0133; email: stramesh@nitt.edu

Received 20 September 2012; Accepted 24 April 2013

ABSTRACT

In the batch study, the adsorption performance of calcium hydroxide-treated fly ash (CFA) in the fluoride removal from aqueous solution was investigated. The effects of various adsorption controlling parameters such as contact time, dosage, solution pH, temperature, and agitation speed on fluoride removal was analyzed. Eighty-nine percent of fluoride was removed by CFA at solution temperature of 50˚C. The kinetic studies and isotherm studies were also performed to understand the sorption ability of CFA. The monolayer adsorption capacity from the Langmuir adsorption equation was found as 10.86 mg/g. Kinetic measurements suggested the involvement of pseudo-second-order kinetics in adsorption. It also suggested that particle diffusion process is not only a rate controlling step process. Overall, the present study showed that the adsorbent is environmental friendly, efficient, and a low-cost adsorbent which is useful for the removal of fluoride from aqueous solution.

Keywords: Adsorption; Alkali-treated fly ash; Batch study; Isotherms; Kinetic study

*Corresponding author.